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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

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Description

A sealing device for sealing and simultaneously cutting a web of material

Technical Field

The present invention relates to a sealing device for sealing and simultaneously cutting a web of material.

5 In particular, the sealing device according to the invention is advantageously used to make a longitudinal seal on and simultaneously trim the excess material from a continuous tubular wrapping made from a web of material.

10 The tubular wrappings concerned are those made from filter paper in an automatic machine for making filter bags such as, for example, bags containing infusion products such as tea or coffee.

Background Art

15 Prior art machines for making filter bags from a web of filter paper comprise a plurality of stations, including a station for feeding a web of filter paper, a folding station and a first station for longitudinally sealing the folded web to form a continuous tubular wrapping of filter paper and preferably for transversally sealing the continuous tubular wrapping to form a succession of filter bags of substantially flattened shape.

20 The longitudinal and transversal sealing station may comprise a specially shaped upper roller with tracks for longitudinally and transversally sealing the continuous tubular wrapping of filter paper. The seals may be made by heat sealing means or, in the solutions of the latest generation, by
25 sonotrodes, positioned in contact with the product to be sealed.

The sonotrode is the transducer element that converts the power supply into vibrations that are discharged onto the product to be sealed.

30 Prior art sealing devices, however, present some disadvantages linked to the fact that the edge of the product, after being sealed, is irregular and therefore requires trimming,

that is to say, an additional cutting operation to obtain a straight, regular edge.

This constitutes a particularly serious drawback at high production speeds when it is even more difficult to guarantee a regular seal, and especially in cases where the quality of the sealed finish has a significant commercial value.

A first aim of the present invention is to provide an ultrasound sealing device that overcomes the above mentioned disadvantages.

A second aim of the invention is to reduce the number of separate steps required to obtain a finished product, for example, in the production of bags from a web of material, whether tubular or not.

Disclosure of the invention

These aims are achieved by a device according to the main claim appended hereto.

The advantages of the device according to the invention lie essentially in the fact that it produces a continuous tubular web that is sealed by ultrasounds and cut along at least one longitudinal edge in a single step.

Description of the drawings

Specifically, the sealing device is an ultrasound sealing device, to which this specification refers but without thereby restricting the scope of the inventive concept, described with reference to two preferred embodiments illustrated in the accompanying drawings in which:

Figure 1 is a schematic front view, with some parts cut away for clarity, of a first preferred embodiment of the sealing device according to the invention;

Figure 2 is a cross section through a vertical plane A-A of the device of Figure 1;

Figure 3 is a cross section through a vertical plane of a second preferred embodiment of the sealing device according to the invention; and

Figure 4 is a top view of a part of the device of Figure 1 for sealing and cutting a longitudinal edge of a web of material.

Detailed description of the preferred embodiments of the invention

5 With reference to the accompanying drawings, the numeral 1 denotes a sealing device for simultaneously sealing and cutting a web of material 2.

Specifically, the web 2 is folded onto itself into a U shape to form a continuous tubular wrapping 3 initially open along one
10 longitudinal edge 30.

The device 1 comprises an ultrasound wave emitter 4, or sonotrode 4, which is designed to move towards the web 2 in a direction Y, preferably vertical, and to act on the latter through a vibrational effect in conjunction with a suitable contact
15 element.

The contact element may consist, for example, of a revolving contact roller 5 positioned tangentially to the sonotrode 4 so as to seal the tubular wrapping 3 longitudinally (direction D) and simultaneously cut it, also longitudinally.

20 During the sealing and cutting operation, the tubular web 3 is fed continuously, in a flattened configuration, between the sonotrode 4 and the contact roller 5 in the longitudinal feed direction D, preferably horizontal.

By way of non-restricting example, Figures 1 to 4 illustrate cutting and sealing of the tubular wrapping 3 along its
25 longitudinal edge 30, originally open, but it will be understood that the device according to the invention may be applied to any part of a web to be sealed and cut.

As illustrated in Figures 1 and 2, the roller 5 is made to
30 rotate about its central axis X positioned transversally to the direction D, in anticlockwise direction of rotation R, indicated in Figure 1, and comprises a substantially cylindrical surface 6, which at at least one end 7 has a substantially wedge-shaped annular protuberance 8 protruding radially from the surface 6
35 itself and one sharp edge 9 of which forms a cutting surface 10.

The cutting surface 10 is designed to act in conjunction with a matching cutting edge 11 made laterally at the sealing end

12 of the sonotrode 4 so that as the roller 5 revolves and the web 2 is fed longitudinally, it creates a scissor effect that cuts off the parts in excess or trimmings 31 from the tubular wrapping 3.

According to the invention, the cut is performed at the same time as a longitudinal seal is made by ultrasounds in the contact region between the sealing end 12 of the sonotrode 4 and the contact surface 6 of the cylinder 5, at the parts in excess, or trimmings 31 of the tubular wrapping 3 which are placed against each other along the longitudinal edge 30.

The parts in excess or trimmings 31 of the tubular web 3 cut off by the scissor effect are extracted by customary means (not illustrated) such as, for example, suction means or the like.

In the embodiment illustrated in Figure 3, the sealing end 12 of the sonotrode 4 has on one side of it a step 13, preferably with a quadrangular cross section, one edge 14 of which is sharp and designed to cut off in scissor-like manner the parts in excess or trimmings 31 of the tubular wrapping 3 by acting in conjunction with the aforementioned cutting surface 10 of the contact roller 5, again simultaneously with the application of the seal along the longitudinal edge of the wrapping 3 itself.

The present invention has been described with reference to preferred embodiments of it, in particular for sealing and cutting an open longitudinal edge 30 of a tubular web 3 fed continuously.

The device according to the invention may, however, be applied to different configurations, as for example, to seal and cut a web of material transversally to its longitudinal direction of feed D.

Similarly, the device might be used to simultaneously seal and cut parts of separate items, that is to say, items that are not fed continuously.

It will be understood that the invention can be modified and adapted in several ways without thereby departing from the scope of the inventive concept. Moreover, all the details of the invention may be substituted by technically equivalent elements.

Claims

1. A device for sealing a web (2) of material, comprising means (4) for emitting ultrasonic radiation, and contact means (5) acting in conjunction with the emitting means (4) in a sealing area, the device being characterised in that the contact means (5) are equipped with at least one cutting surface (10) designed to interact with a matching cutting surface (14) of a sealing end (12) of the emitting means (4) so as to simultaneously seal and cut the web of material (2).

2. The device according to claim 1, characterised in that the cutting surface (10) is defined by a sharp edge (9) of a protuberance (8) of the peripheral surface (6) of the contact means (5).

3. The device according to claim 1 or 2, characterised in that the contact means (5) comprise a contact roller (5).

4. The device according to claim 3, characterised in that the sharp edge (9) is the edge of a protuberance (8) of the cylindrical peripheral surface (6) of the roller (5).

5. The device according to one or more of the foregoing claims, characterised in that the cutting surface (14) of the means (4) consists of a sharp cutting edge (14) of the sealing end (12).

6. The device according to one or more of the foregoing claims from 1 to 5, characterised in that the cutting surface (14) of the means (4) consists of a sharp cutting edge (14) of a stepped surface (13) of the sealing end (12).

7. The device according to claim 6, characterised in that the stepped surface (13) has a quadrangular cross section.

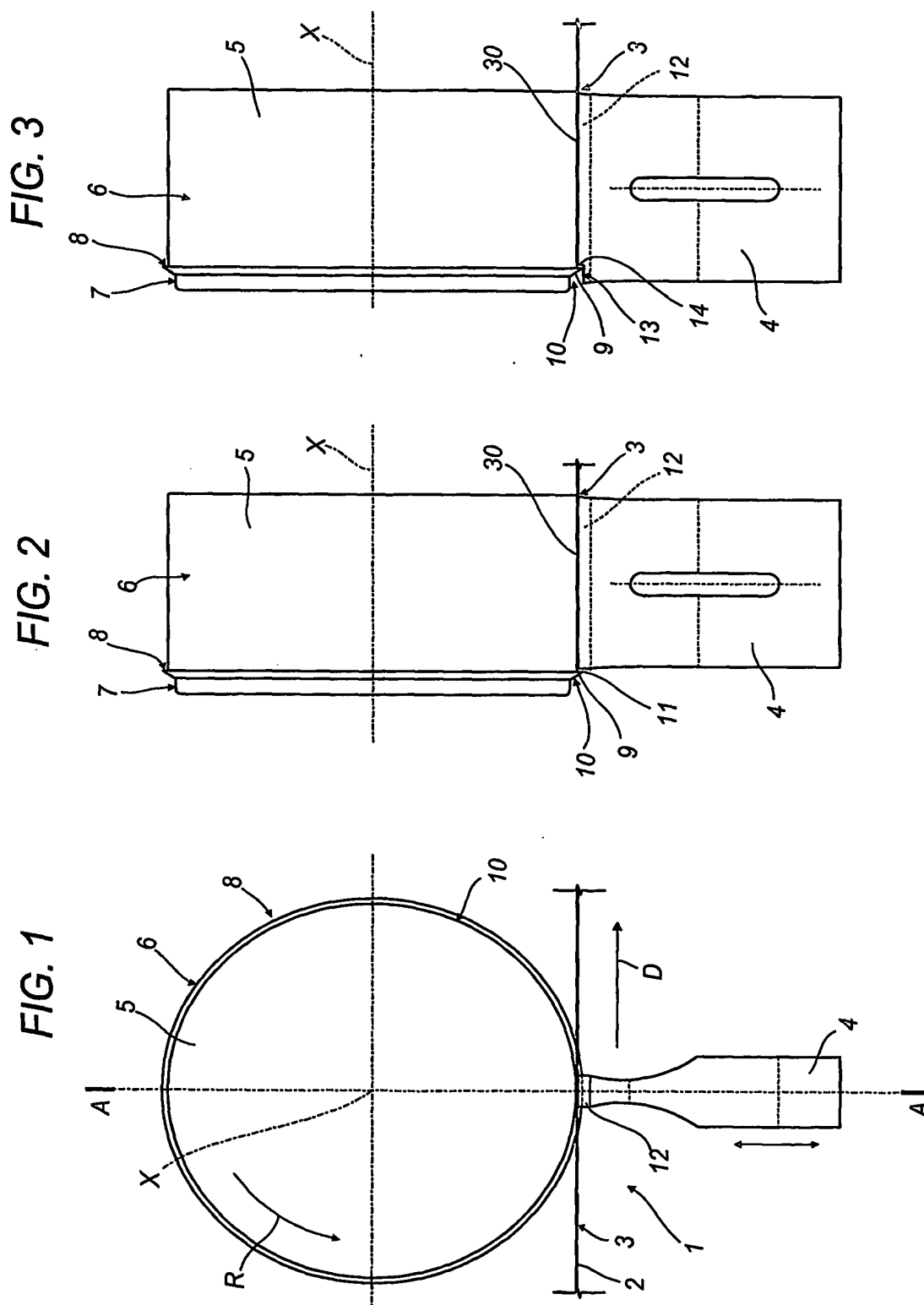
8. A device (4) for emitting ultrasounds for sealing a web of material (2), comprising a sealing end (12), characterised in that

said sealing end (12) has a cutting surface (14) for cutting the web (2).

5 9. The device according to claim 8, characterised in that the cutting surface (14) consists of a sharp cutting edge (14) of a stepped surface (13) of the sealing end (12).

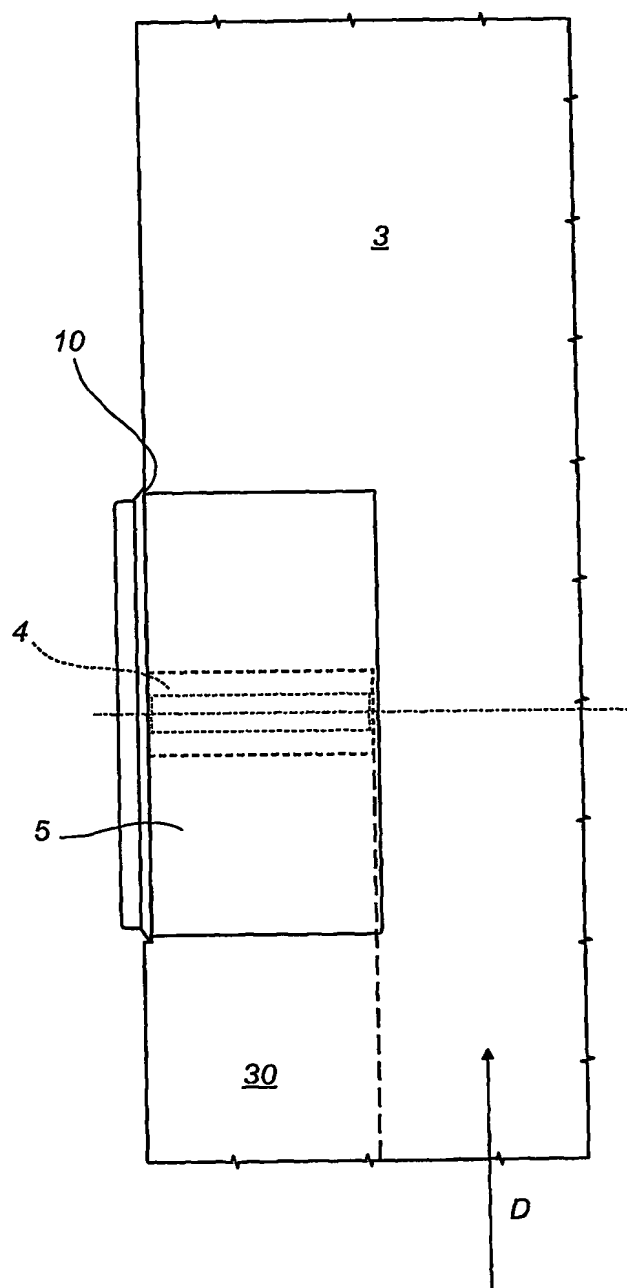
10. The device according to claim 9, characterised in that the surface (13) has a quadrangular cross section.

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FIG. 4



INTERNATIONAL SEARCH REPORT

International Application No
PCT/IB2004/001252

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B29C65/74
//B29C65/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B29C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 016, no. 072 (M-1213), 21 February 1992 (1992-02-21) -& JP 03 261540 A (SONY CORP), 21 November 1991 (1991-11-21) abstract; figures 1-7	1-10
A	US 5 665 196 A (COMBE ROBERT ET AL) 9 September 1997 (1997-09-09) column 4, line 14 - line 26; figures 1,2	1-10

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

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- "P" document published prior to the international filing date but later than the priority date claimed

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- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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Patent document cited in search report		Publication date		Patent family member(s)	Publication date
JP 03261540	A	21-11-1991	JP	2893808 B2	24-05-1999
US 5665196	A	09-09-1997	FR	2720325 A1	01-12-1995